# SOME NOTES ON SUGARCANE PLANTING PROCEDURES

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**Summary**

Experiments were conducted during the period 1958-1960 to study the effects of various factors on germination of sugarcane setts in three different climatic areas each having a different soil type. Such aspects as the effects of mercurial fungicides, removal of trash, length of sett, depth of soil cover and the part of the stalk used for setts were studied at one or more of the three experimental sites. These were located at Illovo, Powerscourt and Wartburg.

The procedure followed was to harvest generally at 3-monthly intervals and to replant immediately so that four seasonal sets of data were obtained per annum. Rainfall data for the individual sites and average temperature data for a single reference site have been included in the results.

General conclusions reached were that mercurial fungicide improved germination sufficiently to warrant the treatment at all sites in all seasons; that removal of closely adhering trash was not warranted; that setts having five eyes should be planted; that soil cover over the setts should be between 2 and 4 inches; and that setts from young parts of the cane stalk should be preferred for setts.


## Introduction

The experiments described in this report were carried out at one or more of three sites. The first was at Illovo, 30° 5[1] S. and 2 miles from the coast, the second was at Powerscourt, 29° 57[1] S. and 18 miles from the coast, and the third was at Wartburg, 29° 30[1] S. and 35 miles from the coast. The respective elevations are approximately 100 ft., 2,000 ft., and 3,000 ft., and the soil types are alluvium, an ordinary T.M.S. and a Mist Belt T.M.S.

The work was initiated at a time in 1958 when large Estate planting programmes were being planned and the Wartburg area was in the throes of considerable sugarcane development. The purpose was to establish procedures which could be recommended generally in each of the three areas for sugarcane planting, it being appreciated that there were fairly wide climatic differences, due mainly to altitude. The data have been processed and are presented at this juncture particularly in view of recently expanded planting programmes throughout the industry and the possible development of new sugarcane growing areas.

Since the circumstances demanded the acquisition of a considerable amount of information over the shortest possible time, small plot techniques were developed especially for the purpose. Blocks 21 yards long and 20, 28 or 32 rows wide were established by drawing furrows 4 ft. 6 ins. apart. The furrows were approximately 12 inches deep from top of ridge to depth of furrow prior to covering the setts. In some instances the blocks were divided into two sub-blocks by closing a one yard break across the middle of the furrowed rows, thus establishing two blocks each 10 yards long. The planned procedure which was generally but not always strictly adhered to, was to harvest the sugarcane plants at 3-monthly intervals by forking the setts gently out of the soil, thus permitting complete shoot studies to be made of the plants. The complete stem and foliage could also then be removed by severing from the setts, and dry weights of material produced could be calculated following laboratory drying of the entire sample, or of a sub-sample if the total amount of material were large.

It was acknowledged that the quality of the seed material would affect results, and that differences between varieties and times of planting would be at least partially due to this factor. In order to eliminate it as thoroughly as possible, however, only the best available seed material was chosen, initially from sources in the field and subsequently from special plots planted for the purpose.

A high level of fertilization was applied annually in the furrow and this was presumed to serve the four 3-month crops satisfactorily. No weeds were allowed to develop in any of the plots.

After harvesting was complete at the end of each 3-month period the furrows were reshaped by hand and the experiment replanted as soon as possible. Unfortunately no soil temperature data were collected, but rainfall data for the individual sites for successive 15-day periods after planting have been given in the tabulated results. Reference temperature data from the Mt. Edgecombe Experiment Station for the 3-monthly periods have also been given. It should be appreciated, therefore, that, whilst rainfall data may be compared from site to site, temperature data are only comparable on a relative basis for seasons at a particular site.

No deliberate attempt was made to identify planting or harvesting times with spring, summer, autumn and winter, each experiment simply being commenced at the earliest opportunity. However, the repetitive nature of the work was such that at least some rough categorization according to season could be attempted, and where useful this has been done arbitrarily on the basis of:

Spring: 25 August to 24 November
Summer: 25 November to 24 February
Autumn: 25 February to 24 May
Winter: 25 May to 24 August

### 1. Treatment with Mercurial Fungicide

*Procedure*

A solution of 1 oz. of mercurial fungicide, containing 3 per cent w/w of metallic mercury, in 1 gallon of water was used to treat setts before planting. The ends of the four-eyed setts were immersed in the fungicidal solution. The allocation of setts to treatments was entirely random, the control treatment being setts not dipped in fungicide. As the average length of a four-eyed sett was slightly less than 18 inches, small gaps were left between 20 setts per treatment per row in the furrow. A standard soil cover was placed over the setts, 2 inches deep and tamped g ently for compaction.

At Illovo only variety N:Co. 376 was used in a half-block, alternate rows being planted with treated and untreated setts in 14 replications. At Powerscourt five varieties were replicated four times with treatments randomly allocated to plots 5 rows by 10 yards in size, and at Wartburg eight varieties were replicated four times with treatments randomly allocated to plots 8 rows by 10 yards in size.

**RESULTS**

TABLE I

**Summary of Data, Treated versus Untreated Setts**

| Item | | Illovo | | | |
|---|---|---|---|---|---|
| | | 27.5.59 to 3.9.59 | 4.9.59 to 3.12.59 | 9.12.59 to 15.3.60 | 16.3.60 to 18.7.60 |
| Season | | Winter | Spring | Summer | Autumn |
| Number of Varieties | | 1 | 1 | 1 | 1 |
| Number of Replications | | 14 | 14 | 14 | 14 |
| Number of eyes per row | | 80 | 80 | 80 | 80 |
| Average number of eyes germinated per variety per replication | Treated | 43.1 | 47.9 | 29.8 | 56.5 |
| | Untreated | 31.6 | 41.7 | 28.0 | 46.0 |
| Total dry weight, gms. per variety per replication | Treated | 591 | 1,181 | 2,830 | 305 |
| | Untreated | 439 | 1,040 | 3,014 | 234 |
| Dry weight per germinated eye, gms. | Treated | 13.7 | 24.7 | 94.9 | 5.4 |
| | Untreated | 13.9 | 25.0 | 107.4 | 5.1 |
| Percentage germination | Treated | 54 | 60 | 37 | 71 |
| | Untreated | 40 | 52 | 35 | 58 |
| | Treated divided by Untreated | 1.35 | 1.15 | 1.06 | 1.22 |
| Rainfall, ins. per 15-day period after planting | First | 0.00 | 0.70 | 1.60 | 3.66 |
| | Second | 0.00 | 1.10 | 0.82 | 1.52 |
| | Third | 2.42 | 1.72 | 1.24 | 1.15 |
| | Fourth | 0.57 | 1.03 | 1.33 | 0.45 |
| | Fifth | 0.08 | 2.61 | 1.77 | 0.11 |
| | Sixth | 0.00 | 1.31 | 1.83 | 0.18 |
| Mean temperature, °C. | | 17.8 | 20.0 | 23.1 | 19.6 |

| Item | | | Powerscourt | |
|---|---|---|---|---|
| | | 20.11.59 to 19.2.60 | 20.2.60 to 27.5.60 | 28.5.60 to 19.8.60 |
| Season | | Spring | Summer | Winter |
| Number of Varieties | | 5 | 5 | 5 |
| Number of Replications | | 4 | 4 | 4 |
| Number of eyes per row | | 80 | 80 | 80 |
| Average number of eyes germinated per variety per replication | Treated | 49.6 | 40.940.0 | 4.6 |
| | Untreated | 43.8 | 40.0 | 2.8 |
| Total dry weight, gms. per variety per replication | Treated | 506 | 1,244 | — |
| | Untreated | 495 | 984 | — |
| Dry weight per germinated eye, gms. | Treated | 10.2 | 31.1 | — |
| | Untreated | 11.3 | 24.6 | — |
| Percentage Germination | Treated | 62 | 50 | 6 |
| | Untreated | 55 | 50 | 4 |
| | Treated divided by Untreated | 1.13 | 1.00 | 1.64 |
| Rainfall, ins. per 15-day period after planting | First | 1.22 | 1.26 | 0.40 |
| | Second | 2.21 | 1.55 | 0.00 |
| | Third | 1.14 | 3.59 | 0.22 |
| | Fourth | 0.52 | 0.87 | 0.00 |
| | Fifth | 3.96 | 1.58 | 0.06 |
| | Sixth | 1.76 | 0.35 | 0.16 |
| Mean Temperature, ° C. | | 22.7 | 21.3 | 17.3 |

TABLE 1—*continued.*

**Summary of Data, Treated versus Untreated Setts.**

| Item | | Wartburg 8.6.59 to 21.10.59 | Wartburg 21.10.59 to 20.1.60 | Wartburg 20.1.60 to 20.4.60 | Wartburg 20.4.60 to 26.7.60 |
|---|---|---|---|---|---|
| Season | | Winter | Spring | Summer | Autumn |
| Number of Varieties | | 8 | 8 | 8 | 8 |
| Number of Replications | | 4 | 4 | 4 | 4 |
| Number of eyes per row | | 80 | 80 | 80 | 80 |
| Average number of eyes germinated per variety per replication | Treated | 36.1 | 52.4 | 46.1 | 31.5 |
| | Untreated | 25.0 | 49.6 | 47.0 | 26.6 |
| Total dry weight, gms. per variety per replication | Treated | 33 | 133 | 304 | — |
| | Untreated | 27 | 87 | 256 | — |
| Dry weight per germinated eye, gms. | Treated | 0.9 | 2.5 | 6.6 | — |
| | Untreated | 1.1 | 1.8 | 5.5 | — |
| Percentage Germination | Treated | 45 | 65 | 58 | 39 |
| | Untreated | 31 | 62 | 59 | 33 |
| | Treated divided by Untreated | 1.45 | 1.05 | 0.98 | 1.18 |
| Rainfall, ins. per 15-day period after planting | First | 0.00 | 0.97 | 1.97 | 4.59 |
| | Second | 0.00 | 3.58 | 3.36 | 0.30 |
| | Third | 0.30 | 1.39 | 1.58 | 0.00 |
| | Fourth | 0.20 | 3.39 | 1.51 | 0.00 |
| | Fifth | 0.10 | 1.40 | 2.72 | 0.03 |
| | Sixth | 0.30 | 0.89 | 1.00 | 0.85 |
| Mean Temperature, ° C. | | 17.8 | 21.9 | 22.7 | 17.7 |

Varieties at Powerscourt: N:Co.'s 292, 293, 339, 376, 382. Varieties at Wartburg: Co.331, N:Co.'s 292, 293, 310, 334, 339, 376 and 382.

Statistical analysis (using arcsin transformation of data):
Powerscourt, 20.11.59 to 19.2.60: Significant difference between varieties. C.V.%=8.52.
20.2.60 to 27.5.60: No significant effects at 5% level. C.V.%=8.10.
28.5.60 to 19.8.60: Significant treatment effect and significant variety by treatment interaction. C.V.%=16.45.

Statistical analysis (using arcsin transformation of data):
Wartburg, 8.6.59 to 21.10.59: Highly significant treatment effects. C.V.%=14.87.
21.10.59 to 20.1.60: No significant effects at 5% level. C.V.%=8.41.
20.1.60 to 20.4.60: No significant effects at 5% level. C.V.%=9.49.
20.4.60 to 26.7.60: Significant differences between varieties and significant treatment effects. C.V.%..11.99.

*Discussion*

McMartin (1949) described an experiment with Co. 331, a variety very susceptible to pineapple disease, in which treatment with a disinfectant increased germination from 9 per cent to 24 per cent. He emphasised that germination figures by themselves could be misleading, the rate of emergence also being an important figure in relation to subsequent tillering, and also that an evenly distributed pattern of germination in the field contributed to final yield as well as the density of shoots. An increase of 14 per cent in yield was obtained due to disinfecting and thereby eliminating gaps which were present in plots of untreated cane, even under conditions of low rainfall. Evans and Wiehe (1947) in Mauritius reported that an average increase of 4 tons of cane per acre was obtained due to treatment with mercurial fungicide, this constituting approximately 15 per cent of the mean yield.

The results shown in Table I confirm that treatment with the fungicide leads to increased germination and dry matter production at the end of a three-month period. The average ratios of percentage germination in treated plots to that in untreated plots by planting seasons for all three locations are as follows:

Spring: 1.11
Summer: 1.01
Autumn: 1.20
Winter: 1.48

Apparently, the slower the germination, the greater the advantage accruing from treatment. It is also interesting to compare the relative dry weight data for the three locations for spring and summer, the only two seasons for which complete results were obtained at all three sites:

The consistent reduction in rate of crop development with increasing altitude is noticeable, and whilst it must be acknowledged that this leads to a weighting

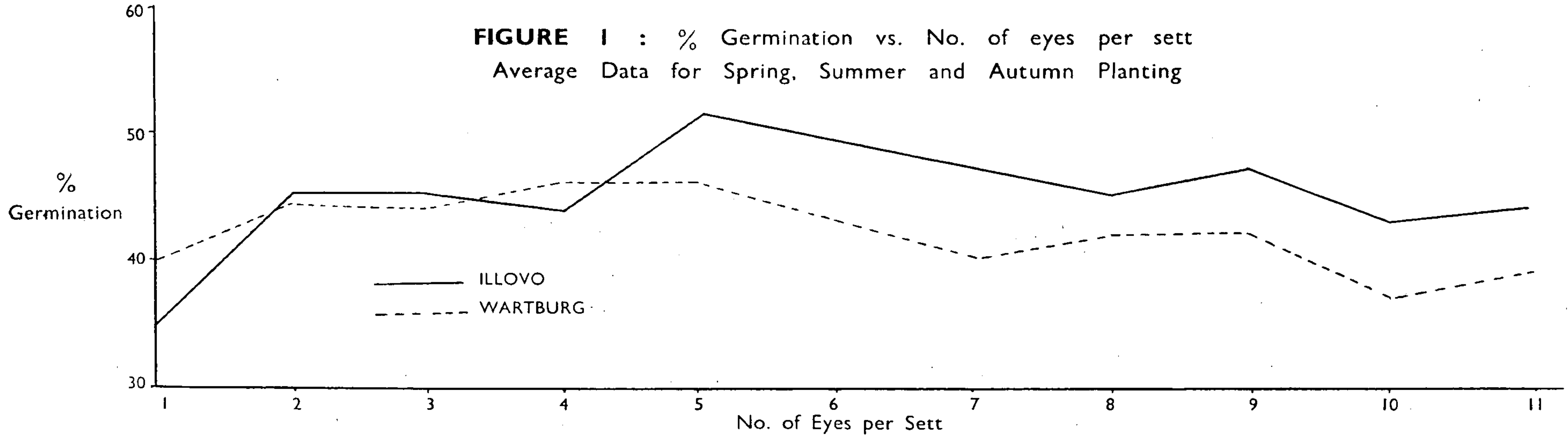


**FIGURE 1 : % Germination vs. No. of eyes per sett**
Average Data for Spring, Summer and Autumn Planting

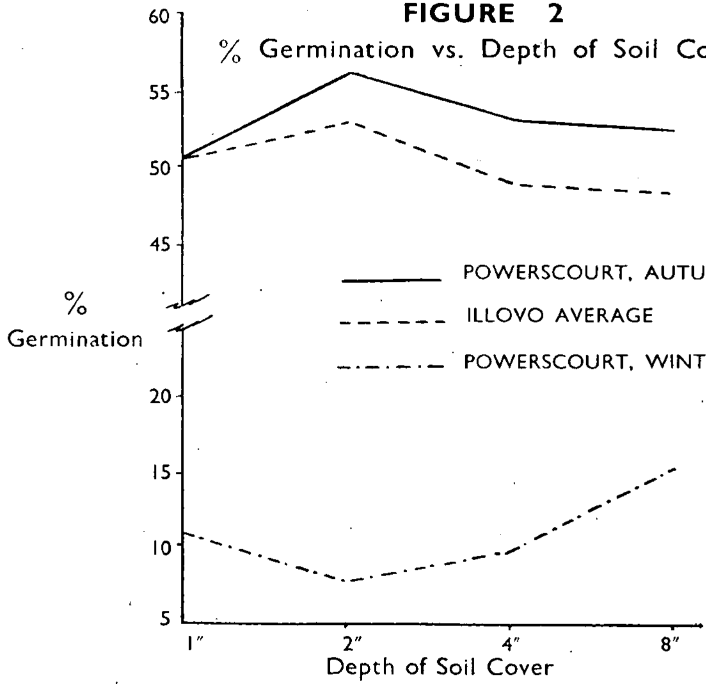


**FIGURE 2**
% Germination vs. Depth of Soil Cover

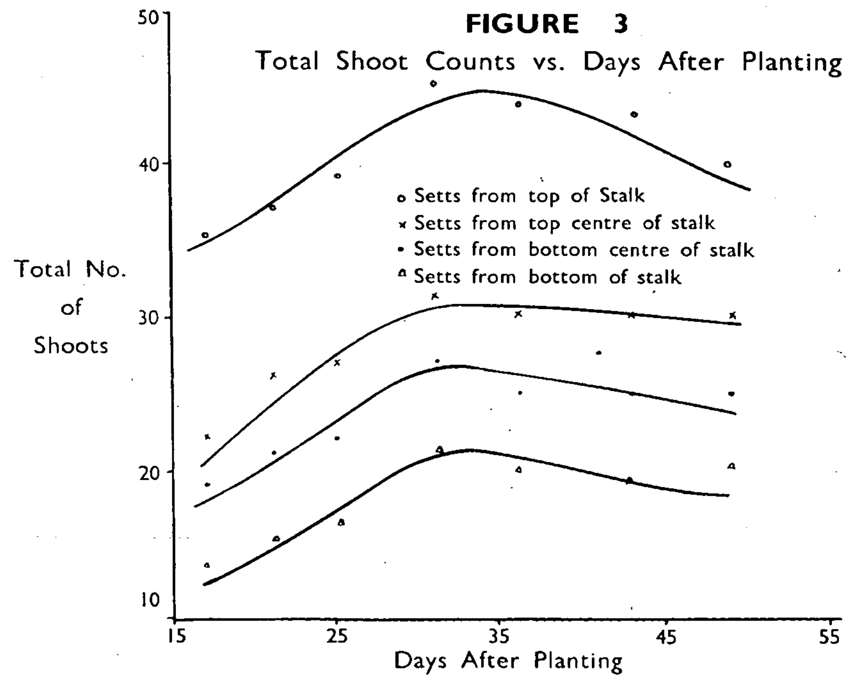


**FIGURE 3**
Total Shoot Counts vs. Days After Planting

| Location | Total Gms. Dry Weight per Replication Spring | | | Location | Total Gms. Dry Weight per Replication Summer | | |
|---|---|---|---|---|---|---|---|
| | Treated | Untreated | Ratio | | Treated | Untreated | Ratio |
| Illovo | 1,181 | 1,040 | 1.14 | Illovo | 2,830 | 3,014 | 0.94 |
| Powerscourt | 506 | 495 | 1.02 | Powerscourt | 1,244 | 984 | 1.26 |
| Wartburg | 133 | 87 | 1.53 | Wartburg | 304 | 256 | 1.19 |
| TOTAL | 1,820 | 1,622 | 1.12 | TOTAL | 4,378 | 4,254 | 1.03 |

effect for the total data, only at Powerscourt was the relative increase due to treatment greater in summer than in spring. Some appreciation of soil temperature effects at the coast and at high altitude may be gained from the average data of Beater (1964) for the South Coast and the Plateau. Soil temperatures taken at the 4-inch depth at 3 p.m. daily for the same seasonal classification suggested above were as follows during the 1960-61 period in bare soil:

| | South Coast | Plateau | Difference |
|---|---|---|---|
| Spring | 27.2° C. | 23.8° C. | 3.4° C. |
| Summer | 30.7° C. | 30.2° C. | 0.5° C. |
| Autumn | 23.2° C. | 23.1° C. | 0.1° C. |
| Winter | 18.6° C. | 18.1° C. | 0.5° C. |

The importance to germination of factors other than rainfall is evidenced by the winter data for Powerscourt and Wartburg in Table II. In both instances there was very little rain during the 3-month period following planting, but 45 per cent of the treated eyes germinated at Wartburg and only 6 per cent at Powerscourt. The antecedent rainfall at the two sites does not explain the difference, and other than seed quality, soil textural differences seem to be the most likely cause of this effect.

All varieties appear to have responded to the fungicidal treatment, as illustrated in the following average data for the two locations at which more than one variety was tested:

**Average % Germination**

| Variety | Powerscourt | | | Variety | Wartburg | | |
|---|---|---|---|---|---|---|---|
| | Treated | Untreated | Ratio | | Treated | Untreated | Ratio |
| Co.331 | — | — | — | Co.331 | 52 | 44 | 1.19 |
| N:Co.292 | 38 | 35 | 1.09 | N:Co.292 | 49 | 43 | 1.14 |
| N:Co.293 | 41 | 33 | 1.24 | N:Co.293 | 53 | 47 | 1.13 |
| N:Co.310 | — | — | — | N:Co.310 | 57 | 44 | 1.28 |
| N:Co.334 | — | — | — | N:Co.334 | 52 | 48 | 1.10 |
| N:Co.339 | 41 | 41 | 1.02 | N:Co.339 | 52 | 45 | 1.14 |
| N:Co.376 | 37 | 34 | 1.07 | N:Co.376 | 55 | 53 | 1.05 |
| N:Co.382 | 39 | 37 | 1.04 | N:Co.382 | 50 | 46 | 1.08 |

## 2. Removing Trash from Seed Cane

*Procedure*

Seed cane was cut in the normal manner but no attempt was made to remove either dry or green leaves from a random selection of stalks which were cut into four-eyed setts. All of the trash was removed from a similar selection of stalks and four-eyed setts prepared. At Illovo only N:Co. 376 was used over four three-month periods, and at Wartburg eight varieties were tested in four replications over a single 4½-month period. Planting and maintenance procedures were the same as those described above for the fungicide experiments, except that all setts were treated similarly with a mercurial fungicide solution.

*Discussion*

This experiment was designed to indicate the overall effect in the field of making no attempt to remove the leaves from seed cane. In practice, most of the dead leaves were inadvertently removed at some stage of the preparation of the setts. The effect of treatment would therefore be expected to be limited to that of green sheaths adhering rather closely to the setts taken from the top of the stalks only, and this would be diluted to the extent that each stalk provided approximately three setts. McMartin (1949) states that leaving the trash on a sett produces primary shoots with long regions underground from which eventually a thicker crop of tillers emerge than when the trash is removed, permitting the primary shoot to emerge directly from the bud. The removal of trash, however, permits very much quicker emergence and gives a much earlier crop of primary shoots.

In Australia (Anon, 1934) trash-bound setts gave lower populations and yields than either two or three eye cuttings with the trash removed. Clements (1940) found that germination was reduced from 100 per cent to 92 per cent when sheaths were not removed from top setts, and that emergence time was increased from 10 days to 13 days. Uniformity of stand was definitely affected.

Statistical analyses of the Wartburg data showed a significant difference between varieties but no significant difference between treatments. In general there appears to be little to be gained or lost by removing trash from seed cane, the gain in dry matter production due to a rapid production of primary shoots from trashed setts aparently being offset by the increased tillering when trash is not removed, since total dry weight production, as shown in Table II, was similar throughout.

TABLE II

**Summary of Data, Trashed and Untrashed Setts**

| Item | | Illovo | | | |
|---|---|---|---|---|---|
| | | 27.5.59 to 3.9.59 | 4.9.59 to 3.12.59 | 9.12.59 to 3.3.60 | 6.4.60 to 6.8.60 |
| Season | | Winter | Spring | Summer | Autumn |
| Variety | | N:Co.376 | N:Co.376 | N:Co.376 | N:Co.376 |
| Number of Replications | | 14 | 14 | 14 | 14 |
| Number of eyes per row | | 80 | 80 | 80 | 80 |
| Average number of eyes germinated per replication | Trashed | 47.3 | 41.7 | 51.4 | 42.3 |
| | Untrashed | 45.6 | 48.5 | 48.9 | 41.3 |
| Total dry weight, gms. per replication | Trashed | 300 | 816 | 1,531 | 535 |
| | Untrashed | 268 | 814 | 1,543 | 500 |
| Dry weight per germinated eye, gms. | Trashed | 6.3 | 19.6 | 29.8 | 12.7 |
| | Untrashed | 5.9 | 16.8 | 31.6 | 12.1 |
| Percentage Germination | Trashed | 59 | 52 | 64 | 53 |
| | Untrashed | 57 | 61 | 61 | 52 |
| | Trashed divided by Untrashed | 1.03 | 0.86 | 1.05 | 1.02 |
| Rainfall, ins. per 15-day period after planting | First | 0.00 | 0.70 | 1.60 | 0.95 |
| | Second | 0.00 | 1.10 | 0.82 | 1.15 |
| | Third | 2.42 | 1.72 | 1.24 | 0.45 |
| | Fourth | 0.57 | 1.03 | 1.33 | 0.25 |
| | Fifth | 0.08 | 2.61 | 1.77 | 0.04 |
| | Sixth | 0.00 | 1.31 | 1.83 | 0.16 |
| Mean Temperature, ° C. | . . . . | 17.8 | 20.0 | 23.1 | 18.0 |

| Item | | Wartburg | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 16.6.59 to 6.11.59 | | | | | | | | |
| Season | | Winter | — | — | — | — | — | — | — | — |
| Variety | | Co. 331 | N:Co. 292 | N:Co. 293 | N:Co. 310 | N:Co. 334 | N:Co. 339 | N:Co. 376 | N:Co. 382 | Av. all var. |
| Number of Replications | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Number of eyes per row | | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| Average number of eyes germinated per replication | Trashed | 12.5 | 15.5 | 20.5 | 37.0 | 11.5 | 22.8 | 22.0 | 18.5 | 20.0 |
| | Untrashed | 12.5 | 23.0 | 21.5 | 36.5 | 10.0 | 22.0 | 22.5 | 11.1 | 19.9 |
| Total dry weight, gms. per replication | Trashed | 23 | 28 | 50 | 70 | 31 | 53 | 49 | 49 | 44.1 |
| | Untrashed | 27 | 40 | 47 | 86 | 27 | 47 | 60 | 18 | 44.1 |
| Dry weight per germinated eye, gms. | Trashed | 1.8 | 1.8 | 2.5 | 1.9 | 2.7 | 2.3 | 2.2 | 2.7 | 2.0 |
| | Untrashed | 2.1 | 1.8 | 2.2 | 2.4 | 2.7 | 2.1 | 2.7 | 1.6 | 2.2 |
| Percentage Germination | Trashed | 16 | 19 | 26 | 46 | 14 | 29 | 28 | 23 | 25 |
| | Untrashed | 16 | 29 | 27 | 47 | 13 | 28 | 28 | 14 | 25 |
| | Trashed divided by Untrashed | 1.00 | 0.65 | 0.96 | 0.98 | 1.08 | 1.04 | 1.00 | 1.64 | 1.00 |
| Rainfall, ins. per 15-day period after planting | First | 0.00 | — | — | — | — | — | — | — | — |
| | Second | 0.30 | — | — | — | — | — | — | — | — |
| | Third | 0.00 | — | — | — | — | — | — | — | — |
| | Fourth | 0.20 | — | — | — | — | — | — | — | — |
| | Fifth | 0.10 | — | — | — | — | — | — | — | — |
| | Sixth | 1.75 | — | — | — | — | — | — | — | — |
| Mean Temperature, ° C. | . . . . | 18.5 | — | — | — | — | — | — | — | — |

Statistical analysis (using arcsin transformation of data):
Wartburg, 16.6.59 to 6.11.59: No significant treatment effects at 5% level. C.V.% = 18.1.

### 3. Number of Eyes per Sett

*Procedure*

Stalks of seed cane were cut up into setts from 1 to 11 or 12 eyes in length, a random selection of stalks being taken for each length. For all sett lengths greater than 1 eye, the count was started alternately at the top and the bottom of the stalk to reduce bias due to the discarding of ends of insufficient length. At Illovo variety N:Co. 376 was studied over seven successive seasons in single replications, and at Wartburg variety N:Co. 293 was used over four seasons in 3 replications each time. Exactly 160 eyes per row were planted in all instances, the final sett for each treatment being reduced in length if necessary to give the standard total. The setts were covered with a 2-inch soil layer, tamped lightly for compaction.

*Results*

TABLE III

**Summary of Data, Number of Eyes per Sett**

| Item | | Illovo | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 18.12.58 to 18.3.59 | 19.3.59 to 20.6.59 | 26.6.59 to 21.9.59 | 22.9.59 to 23.12.59 | 24.12.59 to 17.3.60 | 18.3.60 to 8.6.60 | 9.6.60 to 27.9.60 | Average Spring Summer Autumn |
| Season . . . . . . . . . . . | | Summer | Autumn | Winter | Spring | Summer | Autumn | Winter | Average |
| Variety . . . . . . . . . . . | | N:Co.376 | N:Co.376 | N:Co.376 | N:Co.376 | N:Co.376 | N:Co.376 | N:Co.376 | N:Co.376 |
| % Germination . . | 1 eye/sett | 28 | 1 | 60 | 30 | 63 | 51 | 22 | 35 |
| | 2 | 32 | 4 | 64 | 59 | 72 | 58 | 43 | 45 |
| | 3 | 34 | 18 | 68 | 43 | 74 | 56 | 43 | 45 |
| | 4 | 57 | 11 | 61 | 44 | 56 | 54 | 41 | 44 |
| | 5 | 59 | 22 | 53 | 54 | 67 | 54 | 31 | 51 |
| | 6 | 59 | 28 | 64 | 40 | 63 | 53 | 20 | 49 |
| | 7 | 49 | 25 | 47 | 46 | 66 | 50 | 35 | 47 |
| | 8 | 48 | 17 | 74 | 39 | 63 | 59 | 38 | 45 |
| | 9 | 53 | 26 | 46 | 48 | 73 | 38 | 31 | 48 |
| | 10 | 60 | 31 | 64 | 38 | 74 | 33 | 31 | 47 |
| | 11 | 63 | 9 | 65 | 43 | 62 | 38 | 38 | 43 |
| | 12 | 48 | 16 | 87 | 38 | 78 | 40 | 42 | 44 |
| Dry weight per germinated eye, gms. | 1 eye/sett | 66 | 0.1 | 7.1 | — | 73 | — | — | — |
| | 2 | 56 | 0.8 | 7.1 | — | 67 | — | — | — |
| | 3 | 82 | 0.8 | 9.6 | — | 70 | — | — | — |
| | 4 | 93 | 0.7 | 8.7 | — | 90 | — | — | — |
| | 5 | 86 | 0.6 | 13.1 | — | 72 | — | — | — |
| | 6 | 115 | 0.4 | 9.0 | — | 82 | — | — | — |
| | 7 | 94 | 1.9 | 8.1 | — | 84 | — | — | — |
| | 8 | 87 | 0.7 | 11.5 | — | 88 | — | — | — |
| | 9 | 99 | 0.8 | 11.5 | — | 67 | — | — | — |
| | 10 | 79 | 0.9 | 7.7 | — | 70 | — | — | — |
| | 11 | 87 | 0.8 | 8.3 | — | 79 | — | — | — |
| | 12 | 93 | 2.2 | 7.2 | — | 66 | — | — | — |
| Rainfall, ins./15-day period | First | 3.56 | 0.10 | 2.42 | 1.10 | 0.87 | 3.87 | 0.10 | — |
| | Second | 1.32 | 0.22 | 0.57 | 1.76 | 1.28 | 1.31 | 0.34 | — |
| | Third | 1.84 | 0.87 | 0.08 | 1.07 | 1.27 | 1.15 | 0.01 | — |
| | Fourth | 0.59 | 6.27 | 0.00 | 2.57 | 1.63 | 0.45 | 0.00 | — |
| | Fifth | 1.92 | 0.38 | 2.88 | 1.53 | 1.95 | 0.25 | 0.16 | — |
| | Sixth | 0.67 | 0.00 | 0.70 | 1.58 | 0.55 | 0.04 | 0.49 | — |
| Mean Temperature °C. | . . . . | 23.3 | 20.4 | 17.8 | 20.9 | 23.2 | 19.5 | 17.5 | — |

*Discussion*

The compensating effects involved in the germination of eyes from long and short setts have been described by McMartin (1949). Cutting the stalks counter-balances polar inhibition and gives a larger number of buds a greater chance of developing, exclusive of soil conditions at the time of planting. However, cut cane tissue has been shown to have a toxic effect due to a fermentation process, and germination is inhibited. It can therefore be understood that cutting the stalk into short setts promotes germination for one season and reduces it for another. Clements (1940) showed that under Hawaiian conditions the longer the sett the lower the germination percentage and average shoot vigour. He suggested that eyes in excess of three on a sett were wasted. In Java, according to van Dillewijn (1952), where conditions for germination were favourable, cuttings of two or even only one eye were used, but he reports that in countries where less favourable conditions occur it is acknowledged that longer setts must be used. In

Louisiana, five-eyed setts gave best results in autumn planting, and in Formosa, four- to six-eyed setts were better in severe conditions than shorter setts.

The experiments for which the results are presented here were conducted to determine the optimum length of sett under field conditions over various seasons. McMartin (1949) has suggested that a four-eyed sett might be considered an "average" type for field planting, and from Figure 1 this would appear to be close to the optimum. From the rainfall data in Table III it is obvious that the germination of short setts was favoured by optimum soil moisture conditions as would be expected, but then the longer setts also gave very good germination under such conditions. In fact, on the average both at Illovo and at Wartburg maximum germination occurred at five eyes per sett, and taking all aspects into account it would appear that five-eyed setts should be preferred for these areas at all seasons. The necessity for a consistent stand must be given consideration before suggesting that the slightly reduced germination from 7, 8 and 9-eyed setts might be acceptable in view of the reduced seed preparation which would then be necessary. The tendency for germinated eyes to be concentrated at the distal end of long setts could lead to a rather uneven production of primary shoots, and as previously explained, this could affect ultimate yield.

Table III - Continued

| Item | | Wartburg 8.6.59 to 28.10.59 | 29.10.59 to 27.1.60 | 28.1.60 to 27.4.60 | 28.4.60 to 26.7.60 | Average Spring Summer Autumn |
|---|---|---|---|---|---|---|
| Season | | Winter | Spring | Summer | Autumn | Average |
| Variety | | N:Co.293 | N:Co.293 | N:Co.293 | N:Co.293 | N:Co.293 |
| Percentage Germination | 1 eye/sett | 11 | 64 | 52 | 5 | 40 |
| | 2 | 16 | 67 | 54 | 13 | 45 |
| | 3 | 38 | 61 | 47 | 23 | 44 |
| | 4 | 33 | 60 | 53 | 26 | 46 |
| | 5 | 31 | 58 | 51 | 29 | 46 |
| | 6 | 35 | 54 | 52 | 23 | 43 |
| | 7 | 36 | 51 | 47 | 22 | 40 |
| | 8 | 41 | 54 | 51 | 22 | 42 |
| | 9 | 38 | 54 | 50 | 22 | 42 |
| | 10 | 37 | 54 | 39 | 19 | 37 |
| | 11 | 35 | 48 | 48 | 20 | 39 |
| | 12 | — | — | — | — | — |
| Dry weight per germinated eye, gms. | 1 eye/sett | 0.5 | 0.8 | 1.4 | — | — |
| | 2 | 1.2 | 0.5 | 4.6 | — | — |
| | 3 | 1.6 | 1.0 | 5.5 | — | — |
| | 4 | 1.7 | 0.8 | 6.0 | — | — |
| | 5 | 1.6 | 0.8 | 6.1 | — | — |
| | 6 | 1.6 | 0.9 | 6.4 | — | — |
| | 7 | 1.2 | 1.0 | 6.5 | — | — |
| | 8 | 1.6 | 1.1 | 5.0 | — | — |
| | 9 | 1.5 | 1.0 | 5.6 | — | — |
| | 10 | 1.4 | 0.7 | 7.0 | — | — |
| | 11 | 2.1 | 1.2 | 5.6 | — | — |
| | 12 | — | — | — | — | — |
| Rainfall, ins. per 15-day period | First | 0.00 | 3.45 | 4.25 | 0.39 | — |
| | Second | 0.00 | 0.96 | 1.83 | 0.00 | — |
| | Third | 0.30 | 1.78 | 0.85 | 0.00 | — |
| | Fourth | 0.20 | 3.03 | 2.35 | 0.03 | — |
| | Fifth | 0.10 | 1.16 | 1.94 | 0.85 | — |
| | Sixth | 0.30 | 0.93 | 4.88 | 0.10 | — |
| Mean Temperature, ° C. | | 17.8 | 22.0 | 22.6 | 17.4 | — |

Statistical Analyses (using arcsin transformation of Data):

Wartburg: 8.6.59 to 25.10.59: Highly significant treatment effects. L.S.D.'s: 8.78 (5%), 12.00 (1%). C.V.%=15.3.

29.10.59 to 27.1.60: Significant treatment effects. L.S.D.'s: 5.64 (5%), 7.72 (1%). C.V.%=6.7.

28.1.60 to 27.4.60: No significant treatment effects. L.S.D.'s: 7.40 (5%), 10.11 (1%). C.V.%=9.7.

28.4.60 to 26.7.60: Highly significant treatment effects. L.S.D.'s: 7.42 (5%), 10.15 (1%). C.V.%=16.5.

### 4. Depth of Soil Cover

*Procedure*

The procedure here was to place four-eyed setts in the furrow and to cover them carefully with soil tamped slightly, to the required depth. At Illovo the first experiment was limited to a single replication of eight varieties at only three depths of soil cover, 1 inch, 2 inches and 4 inches. Subsequently N:Co. 376 only was used in six replications at four depths of soil cover, an 8 inch depth being added. At Powerscourt, five varieties were used at four depths in a single replication.

*Results*

TABLE IV

**Summary of Data, Depth of Soil Cover**

| Item | | Illovo | | | | | | | Powerscourt | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2.1.59 to 2.4.59 | 3.4.59 to 10.7.59 | 22.7.59 to 16.10.59 | 26.1.60 to 5.4.60 | 6.4.60 to 5.8.60 | 6.8.60 to 14.10.60 | Average 8.4.59-14.10.60 | 18.3.60 to 17.6.60 | 17.6.60 to 9.9.60 |
| Season | | Summer | Autumn | Winter | Summer | Autumn | Winter | — | Autumn | Winter |
| Number of varieties | | 8 | 1 | 1 | 1 | 1 | 1 | 1 | 5 | 5 |
| % Germination | 1" Cover | 60 | 64 | 66 | 56 | 49 | 19 | 51 | 51 | 11 |
| | 2" Cover | 60 | 78 | 66 | 52 | 43 | 24 | 53 | 56 | 8 |
| | 4" Cover | 52 | 61 | 63 | 46 | 47 | 26 | 49 | 53 | 10 |
| | 8" Cover | — | 48 | 50 | 34 | 45 | 40 | 43 | 52 | 15 |
| Total Dry Weight per Row, gms. | 1" Cover | 2,575 | 25 | 302 | 639 | 463 | 40 | 294 | — | — |
| | 2" Cover | 3,096 | 42 | 338 | 644 | 387 | 71 | 296 | — | — |
| | 4" Cover | 2,709 | 37 | 298 | 641 | 480 | 101 | 311 | — | — |
| | 8" Cover | — | 26 | 273 | 522 | 377 | 43 | 258 | — | — |
| Dry weight per germinated eye, gms. | 1" Cover | 52 | 0.5 | 5.7 | 14.5 | 11.7 | 3.4 | 7.2 | — | — |
| | 2" Cover | 61 | 0.7 | 6.4 | 15.5 | 11.3 | 5.2 | 7.8 | — | — |
| | 4" Cover | 63 | 0.8 | 6.0 | 17.6 | 12.9 | 6.4 | 8.7 | — | — |
| | 8" Cover | — | 0.7 | 6.8 | 21.9 | 10.4 | 5.2 | 9.0 | — | — |
| Rainfall, ins. per 15-day period after planting | First | 1.32 | 0.57 | 0.08 | 1.98 | 0.96 | 0.16 | — | 4.06 | 0.00 |
| | Second | 1.84 | 1.36 | 0.00 | 1.08 | 1.14 | 0.43 | — | 0.99 | 0.22 |
| | Third | 0.59 | 5.74 | 2.88 | 1.85 | 0.45 | 0.12 | — | 1.58 | 0.00 |
| | Fourth | 1.92 | 0.00 | 0.70 | 2.05 | 0.25 | 3.33 | — | 0.35 | 0.06 |
| | Fifth | 0.67 | 0.00 | 1.10 | 2.63 | 0.14 | 1.95 | — | 0.12 | 0.52 |
| | Sixth | 0.10 | 0.05 | 0.14 | — | 0.06 | 0.09 | — | 0.40 | 0.31 |
| Mean Temperature °C. | | 23.2 | 19.2 | 18.4 | 23.2 | 18.0 | 18.9 | — | 19.4 | 17.6 |

Varieties at Illovo, 21.1.59-2.4.59: Co.331, N:Co.'s 292, 293, 310, 334, 339, 376, 382.
Varieties at Powerscourt: Co.331, N:Co.'s 293, 339, 376, 382.

Statistical analyses (using arcsin transformation of data):

Illovo, 3.4.59 to 10.7.59: Significant treatment effects. L.S.D.'s: 11.98 (5%), 16.56 (1%). C.V.%: 18.6.
22.7.59 to 16.10.59: Highly significant treatment effects. L.S.D.'s: 3.70 (5%), 5.11 (1%). C.V.%: 5.8.
26.1.60 to 5.4.60: Highly significant treatment effects. L.S.D.'s: 3.18 (5%), 4.40 (1%). C.V.%: 5.9.
6.4.60 to 5.8.60: No significant treatment effects. C.V.%: 11.5.
6.8.60 to 14.10.60: Highly significant treatment effects. L.S.D.'s: 5.72 (5%), 7.91 (1%). C.V.%: 15.1.

*Discussion*

The optimum depth of soil cover over sugarcane setts in the furrow is likely to be affected by weather conditions, soil texture and degree of soil compaction, and generalizations from the results of the experiments reported here should therefore be limited accordingly. In field practice it may be difficult to maintaian an accurate depth of soil cover, but nevertheless a definite recommendation for the guidance of field men is necessary.

The results in Table IV show that, whilst under certain conditions a shallow covering of soil may lead to satisfactory germination, equally good germination and maximum dry matter production can be expected when 2 inches to 4 inches of soil cover is used. The conditions under which deeper depths of soil cover led to better germination at Powerscourt (see Figure 2) can scarcely be regarded as suitable for planting. The general increase in dry matter produced per germinated eye with depth of soil cover at Illovo was presumably due to the increased tillering of the deeper-placed setts.

### 5. Part of Stalk used for Setts

*Procedure*

Stalks of eight varieties of sugarcane regarded as being suitable for seed cane, and having as nearly as possible 12 eyes per harvested stalk, were cut into four setts each of four eyes, and the parts identified as top (T), top centre (TC), bottom centre (BC) and bottom (B). These were planted at Illovo in two replications on 19th December, 1958, and germination counts carried out over a period of 32 days from 5th January, 1959. There were 10 setts per quarter row of 5 yards in length.

*Results*

TABLE V

**Total Shoot Counts, Sets from Different Parts of Stalk**

| Variety . . . | Co. 331 | | | | N:Co. 292 | | | | N:Co. 293 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date . . . | T | TC | BC | B | T | TC | BC | B | T | TC | BC | B |
| 5.1.59 . . . | 40 | 30 | 23 | 15 | 26 | 12 | 2 | 4 | 32 | 16 | 12 | 7 |
| 9.1.59 . . . | 40 | 38 | 27 | 19 | 31 | 14 | 5 | 6 | 33 | 18 | 16 | 11 |
| 13.1.59 . . | 46 | 38 | 27 | 21 | 32 | 17 | 5 | 7 | 35 | 21 | 19 | 13 |
| 19.1.59 . . | 49 | 45 | 33 | 23 | 39 | 20 | 10 | 12 | 43 | 25 | 23 | 20 |
| 24.1.59 . . | 48 | 45 | 33 | 23 | 39 | 19 | 9 | 9 | 44 | 23 | 22 | 18 |
| 31.1.59 . . | 46 | 39 | 30 | 23 | 37 | 18 | 9 | 9 | 43 | 23 | 23 | 17 |
| 6.2.59 . . . | 46 | 37 | 33 | 25 | 35 | 18 | 9 | 9 | 43 | 25 | 24 | 17 |

| Variety . . . | N:Co. 310 | | | | N:Co. 334 | | | | N:Co. 339 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date . . . | T | TC | BC | B | T | TC | BC | B | T | TC | BC | B |
| 5.1.59 . . . | 56 | 29 | 26 | 16 | 33 | 44 | 35 | 30 | 23 | 7 | 10 | 4 |
| 9.1.59 . . . | 61 | 31 | 25 | 16 | 39 | 44 | 36 | 29 | 26 | 13 | 11 | 6 |
| 13.1.59 . . | 64 | 30 | 27 | 19 | 38 | 47 | 36 | 30 | 26 | 15 | 12 | 8 |
| 19.1.59 . . | 68 | 31 | 36 | 23 | 43 | 52 | 42 | 33 | 34 | 19 | 19 | 11 |
| 24.1.59 . . | 61 | 34 | 30 | 23 | 38 | 49 | 41 | 34 | 38 | 18 | 19 | 11 |
| 31.1.59 . . | 64 | 33 | 32 | 22 | 42 | 51 | 42 | 34 | 37 | 18 | 15 | 11 |
| 6.2.59 . . . | 56 | 34 | 26 | 25 | 37 | 49 | 42 | 35 | 32 | 18 | 17 | 11 |

| Variety . . . | N:Co. 376 | | | | N:Co. 382 | | | | Average | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date . . . | T | TC | BC | B | T | TC | BC | B | T | TC | BC | B |
| 5.1.59 . . . | 19 | 17 | 20 | 17 | 48 | 24 | 25 | 12 | 35 | 22 | 19 | 13 |
| 9.1.59 . . . | 18 | 21 | 21 | 18 | 50 | 25 | 27 | 16 | 37 | 26 | 21 | 15 |
| 13.1.59 . . | 22 | 22 | 21 | 18 | 51 | 25 | 28 | 15 | 39 | 27 | 22 | 16 |
| 19.1.59 . . | 27 | 26 | 23 | 24 | 58 | 29 | 29 | 18 | 45 | 31 | 27 | 21 |
| 24.1.59 . . | 25 | 24 | 21 | 22 | 58 | 29 | 29 | 18 | 44 | 30 | 25 | 20 |
| 31.1.59 . . | 25 | 28 | 23 | 21 | 50 | 28 | 27 | 16 | 43 | 30 | 25 | 19 |
| 6.2.59 . . . | 22 | 27 | 20 | 21 | 51 | 29 | 30 | 16 | 40 | 30 | 25 | 20 |

*Discussion*

It has been widely shown that the propensity of sugarcane eyes to germinate decreases from the top of the stalk downwards, and the results in Table V confirm that this held true for four-eyed setts from six out of eight varieties, N:Co. 334 and N:Co. 376 being the exceptions, under the conditions of this experiment. It should be appreciated that in view of the extremely rapid tillering of the young shoots, the results given in Table V and Figure 3 refer to total shoot counts and not strictly germination counts. The data are presented mainly to illustrate the very large differences which might be obtained in germination from setts taken from different parts of the stalk. On the average, tops gave over 100 per cent more shoots 32 days after planting than setts taken from the bottom of the stalk.

*Conclusions*

The general conclusions which may be drawn from the results of the experiments reported in this paper may be framed best, perhaps, in the form of the recommendations for Estate field practice which were their outcome:

1. Setts should always be dipped in commercially available mercurial fungicide solution, made up at the rate of 1 oz. to 1 gallon of water, prior to planting.
2. All trash may be regarded as potential protection for sugarcane eyes during transport to the planting area. In the planting field dry trash which would be shed in any event during planting operations may be removed, but the adhering green sheaths need not be removed unless there is a special reasonf or promoting rapid primary shoot production.

3. Stalks should be cut into setts having five eyes.
4. Setts should be covered by at least two inches of soil and not more than four inches.
5. Seed cane selection should be with a view to obtaining a maximum proportion of young stalk for setts. The older the portion of the stalk from which the sett is cut, the poorer the potential germination.

These generalizations may be applied to a wide range of varieties of sugarcane, to climates varying from the coastal to that at 3,000 ft. altitude, and to soils varying in type from the sandy Ordinary T.M.S. to an Alluvium and a Mist Belt T.M.S.

*Acknowledgments*

The authors wish to acknowledge the co-operation of the management and staff of the Windy Hill Wattle Co. Ltd., in providing the site and supervision for the Wartburg experiments. Credit is also due to Mr. H. Dicks, Biometrician at the Experiment Station, for the statistical analysis of data.

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**Mr. Wilson** (in the chair): The purpose of this work was to bring sound facts to light on which to base field practice. The work was conducted at three different sites some distance apart, and much of it has been confirmed by work carried out by the Experiment Station recently. What was the planting depth?

**Mr. Thompson:** Twelve inches deep from top of ridge to depth of furrow, prior to covering the setts.

**Dr. Dick:** If there is no particular reason for leaving trash on setts it should be removed as a precaution against mealie bug.

**Mr. Hampson:** Some years ago deep planting was customary, down to 15 inches, but we are now planting much shallower without apparent detrimental effect to plant canes or ratoons. Are we correct in doing so?

**Mr. Thompson:** This experiment was not for depth tests but others carried out at the Experiment Station have compared shallow, medium and deep furrows on three soil types. Shallow furrows showed no loss and on one soil a significant gain in the ratoon stage.

**Dr. Cleasby:** Tongaat has repeated some of the experiments carried out at Illovo with the same results. Additional experiments were also carried out, one to test the effect of Deoldrex, the insecticide, which was mixed with Aretan. Total green matter above ground was harvested at three months and germination counts assessed. Germination did not vary with depth of furrow but green matter was greater from shallower planting, and the degree of tillering was improved. The shallowest planting was 2 inches below ground.

**Mr. Wilson:** With all that confirmation about shallow planting Mr. Hampson should be quite reassured.

**Mr. du Toit:** It would be interesting to know the reasons behind some of the findings in this paper. Why do top setts germinate much quicker, why is there such a terrific difference in dryweight between Illovo and Wartburg, and lastly, how does Windy Hill get up to a yield comparable with the other areas although it gets such a slow start?

**Mr. Brown:** What special reason could there be for wanting to promote rapid primary shoot production?

**Mr. Thompson:** If a period of probable low rainfall is approaching you would want quick germination, and if you were planting in autumn rather than spring, in order to get your cane away.

**Mr. Horst:** Were the setts placed in the furrows with any special regard to the eyes?

**Mr. Thompson:** No, they were placed at random because this is the estate practice.

**Mr. Wilson:** If a stick is placed on the surface and pressed down with the foot, the eyes in contact with the ground will be the ones to germinate.

**Mr. Souchon:** What age should plant cane be?

**Mr. Thompson:** It is stated in the conclusions of the paper that "seed cane selection should be with a view to obtaining a maximum proportion of young stalk for setts".

**Mr. Hampson:** Has it been established whether use of old plant cane will have a detrimental effect on the final product?

**Mr. Wilson:** Some four or five years ago, during the drought, a farmer in the Empangeni area was advised by us to plant 24 month cane, provided the eyes were sound. He did so with excellent results.

**Dr. Brett:** The explanation usually given for young buds germinating better than old ones is that the plant hormone "auxin", manufactured in the leaves, travels down the cane and accumulates at the base, and this hormone tends to inhibit germination.

It is misleading to rely on early counts and early weights, for often a startling difference can be obtained in germination which does not show up in the final yield.

**Mr. Bartlett:** I would like confirmation of what is said in the "Conclusion", namely, that trash need not be removed from seed cane. This would indeed save labour.

**Dr. Dick:** If you wish to inspect for mealie bug you must remove the trash anyway.

**Mr. Pearson:** Reference is made to the work of Clements, who says emergence increases with depth of cover. The plots in these experiments were kept weed-free, and rapid emergence does make weeding easier.

**Mr. Halse:** In these experiments the cane was covered to six inches and then immediately soil was removed from the cane row until the required depth of two inches was reached.

**Mr. Cheves:** Has any work been done on age of seed cane that is heat treated, and does heat treatment damage the eyes?

**Mr. G. M. Thomson:** Trials have been done on a particular variety taking the top, middle and bottom of the stalk. Taking the categories the authors use in this paper, the top centre would be the best of the stalk for hot-water treated cane, followed by the bottom and the top.

**Mr. Hempson:** In our experience an application of potash to seed cane a few months before it is used leads to vigorous germination. On one occasion many years ago, frosted cane, which had started to sprout, was used as seed cane and planted at the wrong time of the year and yet excellent germination followed.

As regards fungicides, usually only the ends of the setts are dipped, but to save time we have been throwing the lot into drums. Is this a waste of money or might it benefit the setts?

**Mr. G. M. Thomson:** We have been asked before about dipping the ends in fungicides, in say a hot water tank, but it is not economical. We recommend using the fungicide after the hot water treatment. Probably no harm will be done by dipping the complete sett in fungicide.

**Mr. Wyatt:** We have found that heat treating does impair germination, particularly in N:Co.376. We are dipping the whole sett in a bath of fungicide afterwards and by letting the setts drain we do not use much more fungicide.

**Dr. Cleasby:** Heat treatment is a logical development of this discussion and we have some results to show its value. N.52/11 treated — 62 tons per acre, untreated (same seed material) — 57.3 tons per acre; N:Co.376 treated — 75.1 tons per acre, untreated (same seed material) — 62.5 tons per acre.